

## Redescription of *Ceratophysella lawrencei* (Gisin, 1963) (Collembola: Hypogastruridae)

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**Redescription of *Ceratophysella lawrencei* (Gisin, 1963) (Collembola: Hypogastruridae).** - *Ceratophysella lawrencei* (Gisin, 1963) is redescribed based on material from Switzerland (types), Austria, Italy and Poland. A lectotype is designated. Notes on morphology of the closely related species *Ceratophysella neomeridionalis* (Nosek & Červek, 1970) are given.

**Keywords:** Collembola - Hypogastruridae - *Ceratophysella lawrencei* - *Ceratophysella neomeridionalis* - taxonomy - Europe.

### INTRODUCTION

During a faunistic survey in the Tatra National Park (S Poland) numerous *Ceratophysella* specimens with 2 + 2 spine-like setae on the head were found. Identification led to *C. lawrencei* with some doubts. This species is insufficiently known and available literature does not allow to recognize it unambiguously (Thibaud *et al.*, 2004). Therefore, a redescription is presented here.

Gisin (1949) briefly described *Hypogastrura gibbosa* (Bagnall, 1940) with 2 + 2 spine-like setae on the head from the Swiss Alps. Later in "Collembolenfauna Europas" (Gisin, 1960) he repeated the short species diagnosis and noticed that the identity of British and Swiss specimens of *H. gibbosa* is doubtful. His suspicion turned out to be true when Lawrence (1962) redescribed this species based on Bagnall's types from Great Britain. He stated that *H. gibbosa* sensu Gisin 1949, 1960 with cephalic spines refers to a different species. As a consequence Gisin (1963) established a new species, *H. lawrencei* by giving a reference to previous descriptions (Gisin, 1949, 1960).

Examination of Gisin's material allowed to redescribe this species using a set of modern diagnostic characters (Fjellberg, 1984, 1998/1999; Babenko *et al.*, 1994; Skarżyński, 2004). Moreover, a lectotype was designated.

***Ceratophysella lawrencei* (Gisin, 1963)**

*Hypogastrura lawrencei* Gisin, 1963: 97.

*Hypogastrura gibbosa* (Bagnall, 1940): Gisin 1949, 1960 nec Bagnall, 1940.

TYPE MATERIAL: Lectotype - male on slide (formerly in alcohol), by present designation; He 242a: Grisons, Swiss National Park, Plan Possa (above Il Fuorn), S slope, *Pineto-Caricetum humilis*, 1900 m a. s. l., 13. V. 1945, soil sample (1-4 cm) (in the collection of the Muséum d'histoire naturelle in Geneva), paralectotypes - 5 specimens of unidentified sex on slides (one of them formerly in alcohol), same data as lectotype.

OTHER MATERIAL EXAMINED: 3 specimens of unidentified sex on slide; He 422: Grisons, Swiss National Park, Il Fuorn, S slope, on the way to Plan Posa, *Mugeto-Ericetum caricetosum humilis*, 1850 m a. s. l., on mushrooms, 22-24.VIII. 1950. 2 specimens of unidentified sex on slide; Törne, [illegible inscription - probably one of collecting sites of *H. cf. gibbosa* in Austria mentioned in Törne (1958)], 27.II.1951 (the material is preserved in the collection of the Muséum d'histoire naturelle in Geneva). 1 female, 3 juveniles on slide; moss on calcareous rocks (ca. 2000 m a. s. l.), neighborhood of Cortina d'Ampezzo (Dolomites, Alps, N Italy), 20.VI-II.1993, leg. D. Skarżyński. 12 males, 10 females, 8 juveniles on slides; moss and mountain grasslands with mushrooms on calcareous rocks: deep ravine Kraków (ca. 1100 m a. s. l.), entrance to the cave Mylna (ca. 1100 m a. s. l.), N slope of the Gładkie Uplaziańskie (ca. 1600 m a.s.l.), W slope of the Chuda Turnia (ca. 1800 m a. s. l.) (Tatra Mountains, Carpathians, S Poland), 18.VI.2004, 19.VIII.2004, leg. D. Skarżyński (the material is preserved at the Department of Biodiversity and Evolutionary Taxonomy, Wrocław University, Poland).

DIAGNOSIS: This species can be recognized by the following set of characters: fields of coarse granulation on head, thoracic and abdominal terga present, dorsal chaetotaxy of the *C. armata*-type, setae long, thick and serrated, setae  $d_2$  and  $oc_2$  on head spine-like, setae  $p_3$  on abdominal tergum IV present, antennal segment IV with ca. 25 modified ventral sensilla, eversible sac between antennal segments III-IV present, head of maxilla and labium of the *C. armata*-type, outer lobe with 1 sublobal hair, empodial appendage with long apical filament reaching distinctly beyond inner tooth of claws, dens with uniform, fine granulation and 7 setae (2-4 inner setae modified), mucro boat-like with large lateral lamella, anal spines large, curved, situated on high basal papillae.

REDESCRIPTION: Body length 0.9-1.6 mm (lectotype, male 0.95 mm). Colour of the body dark greyish-violet (in freshly collected specimens from the Tatra Mts, greyish-brown in alcoholic lectotype and paralectotype), legs and ventral part of the body paler, eyes fields black, anal spines yellow.

Integument with fine granules and fields of coarse granulation on head (large uniform field covering almost whole dorsal side excluding bases of antennae), thoracic terga II-III (two subaxial fields of medium size), abdominal terga I-III (small fields around macrochaetae  $p_2$ ), abdominal tergum IV (one axial field of medium size and two lateral large ones), abdominal terga V-VI (large fields covering almost whole surface) (Figs 1-3). Fields made of rather irregularly distributed granules, which are broad, moderately high and sometimes bent in different directions (Figs 1-3). On abdominal tergum V coarse granules are usually loosely distributed from the line extended between setae  $a_1$  to the line extended between setae  $p_1$ , behind this line granules are slightly smaller and densely packed. 8-10 granules between setae  $p_1$  (Fig. 3).

Dorsal chaetotaxy as in Figs 1-3. Microchaetae and macrochaetae (especially on last abdominal terga) long, thick and serrated (Figs 1-3). Body sensilla (s) short, thin and smooth. Setae  $d_2$  and  $oc_2$  on head spine-like in unreproductive adults (Fig. 1), in juveniles like normal or thickened macrochaetae, rarely spine-like. Setae  $a_2$  on thoracic tergum II like mesochaetae or macrochaetae. Setae  $p_1$  and  $p_2$  on abdominal tergum IV macrochaetae and microchaetae respectively, setae  $p_3$  present. Subcoxae I, II, III with 1, 2, 3 setae respectively. Microsensillum (ms) on thoracic tergum II present.

Antennal segment IV with simple apical vesicle, subapical organite, microsensillum, 7 cylindrical sensilla in typical arrangement and ca. 25 short, thick, curved

and flattened at tips sensilla in ventral file (Fig. 5). Antennal III-organ with two long (lateral) and two short (internal) curved sensilla. Microsensillum on antennal segment III present. Eversible sac between antennal segments III-IV present (Fig. 5). Antennal segment I with 7 setae.

Ocelli 8+8, G and H slightly smaller than others (Fig. 1). Postantennal organ about twice as large as single ocellus, with 4 lobes of which the anterior pair is distinctly larger than the posterior (Fig. 4). Large accessory boss partly surrounded by posterior lobes of postantennal organ (Fig. 4).

Labrum with 5, 5, 4 setae and 4 prelabrals. Head of maxilla of the *C. armata*-type (see Fjellberg, 1984). Outer lobe with 1 sublobal hair. Labium of the *C. armata*-type (see Fjellberg, 1998/1999).

Tibiotarsi I, II, III with 19, 19, 18 setae respectively, clavate setae absent. Claws with inner tooth and pair of lateral teeth (Fig. 6). Empodial appendage with broad basal lamella and long apical filament reaching beyond inner tooth of claws (Fig. 6), ratio: empodial filament/ inner edge of claws = 0.7-1 (0.5-0.7 in the Tatra Mts population).

Ventral tube with 4+4 setae.

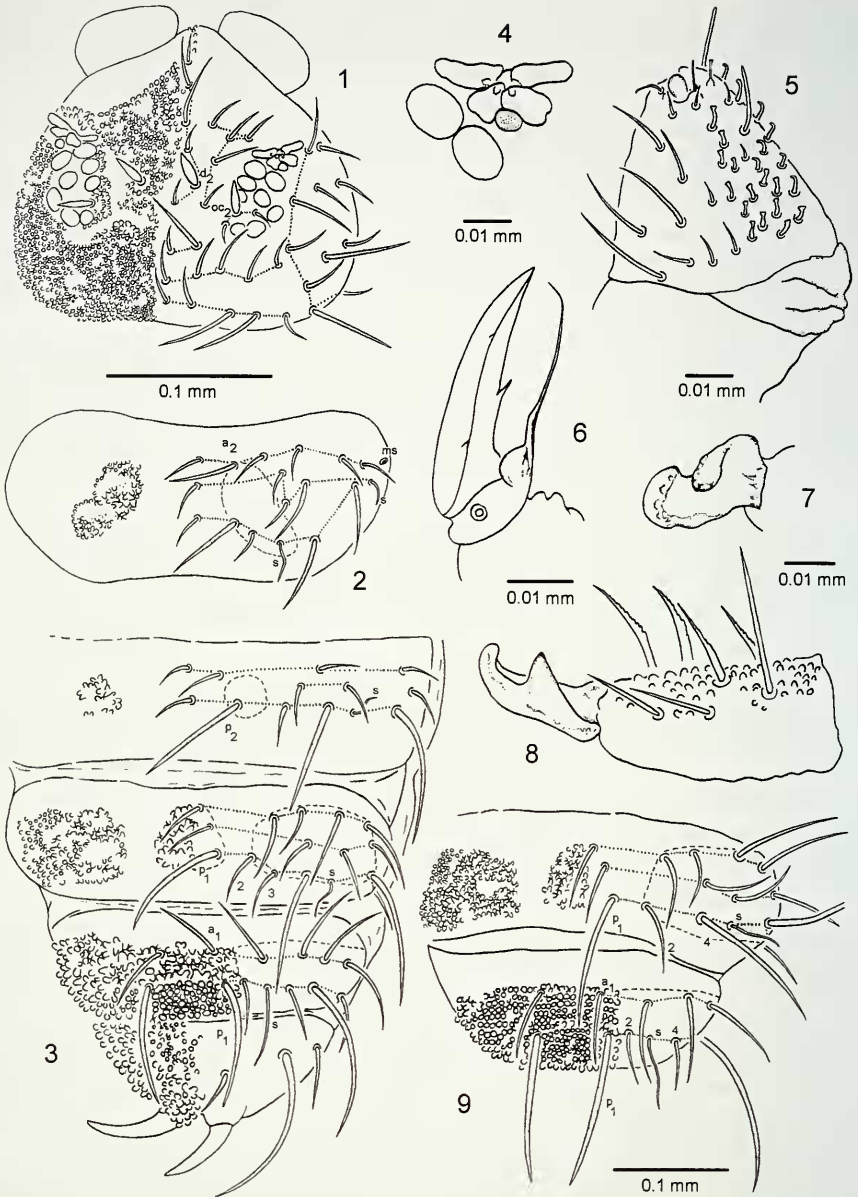
Furca fully developed. Dens with uniform, fine granulation and 7 setae (2-4 inner setae modified) (Fig. 8). Mucro boat-like, with large lateral lamella (Figs 7, 8). Ratio: dens/mucro = ca. 2. Retinaculum with 4+4 teeth.

Anal spines large, curved, situated on high basal papillae (Fig. 3). Ratio: anal spines/inner edge of claws III = ca. 1.5.

DISCUSSION: *C. lawrencei* resembles these species of the *C. armata*-group which have integument with fields of coarse granulation. It distinctly differs from *C. granulata* Stach, 1949 and *C. scotica* (Carpenter & Evans, 1899) in having spine-like setae on head (v. absent) and from *C. silvatica* (Rusek, 1964) in their number (*C. lawrencei*: 2 + 2, v. 1 + 1). This species is also easy to distinguish from *C. franzi* (Butschek & Gisin, 1949) by different arrangement of cephalic spine-like setae (*C. lawrencei*:  $d_2$  and  $oc_2$ , v.  $d_2$  and  $sd_5$ ).

Undoubtedly *C. lawrencei* is closely related to *C. neomeridionalis* (Nosek & Červek, 1970) – a species described from the Slovenian Dinaric Mountains (Nosek & Červek, 1967, 1970) and also known from the Polish Carpathians (Weiner, 1981, Smolis *et al.*, 2001, Skarżyński & Smolis, 2002, Smolis & Skarżyński, 2003). They differ in the structure of empodial appendage (*C. lawrencei*: basal lamella broad, apical filament long reaching beyond inner tooth of claws, v. basal lamella small, apical filament short reaching distinctly below inner tooth of claws) and arrangement of setae on abdominal tergum IV (*C. lawrencei*: setae  $p_3$  present, v. setae  $p_3$  absent).

Nosek & Červek (1967) considered chaetotaxy of the last abdominal terga of *C. neomeridionalis* characteristic for this species. However this opinion seems to be a result of erroneous identification of some setae. It is evident after examination of paratype from the collection of the Muséum d'histoire naturelle in Geneva (Nanos, 7.XI.64, leg. S. Červek) and specimens collected in the Polish Carpathians that they have body sensilla on abdominal tergum IV in typical position  $p_5$  (Fig. 9) ( $p_7$  in original description, see Nosek & Červek, 1967: 247, Fig. 8), setae  $p_1$  on abdominal tergum V as strong macrochaetae, setae  $p_2$  and  $p_4$  as short microchaetae and long body



FIGS 1-9

*Ceratophysella lawrencei* (1-8): 1, chaetotaxy and granulation of head; 2, chaetotaxy and distribution of coarse granulation fields on thoracic tergum II; 3, chaetotaxy and distribution of coarse granulation fields on abdominal terga III-VI; 4, postantennal organ, accessory boss and neighbour ocelli; 5, ventral side of antennal segments III-IV; 6, claw of legs I; 7, mucro; 8, dens and mucro, lateral view. (1-4, 6: lectotype; 5, 7, 8: specimen from Tatra Mts). *Ceratophysella neomeridionalis*: 9, chaetotaxy and distribution of coarse granulation fields on abdominal terga IV-V (paratype). Abbreviations in text.

sensilla (Fig. 9) (in original description  $p_1$  is short microchaeta,  $p_2$  is long microchaeta, sensillum is short and  $p_4$  is macrochaeta, see Nosek & Červek, 1967: 247, Fig. 8).

DISTRIBUTION: *C. lawrencei* was recorded from the Swiss, Austrian and Italian Alps, the Appenines (Gisin, 1949, 1960, 1963; Törne, 1958; Christian, 1987; Dallai *et al.*, 1995) and for the first time from the Polish Tatra Mts (Carpathians).

ECOLOGICAL REMARKS: *C. lawrencei* seems to prefer different microhabitats (soil, forest litter, moss tufts, mountain grasslands, mushrooms) associated with calcareous rocks in the mountains at an altitude 900-2000 m a. s. l.

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